STATUS OF GYPSY MOTH POPULATIONS AT PATUXENT RIVER NAVAL AIR STATION AND INDIANHEAD NAVAL ORDNANCE STATION

Prepared by

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INTRODUCTION

On September 29 and October 6, 1992, USDA Forest Service personnel conducted gypsy moth egg mass surveys at Patuxent River Naval Air Station and Indian Head Naval Ordnance Station. The purpose of these surveys was to determine population densities and to assess the potential for defoliation and the possible need for treatment in 1993.

METHODS

Gypsy moth survey plots were randomly selected based upon available host trees (oaks), size of sample area, uniformity between egg mass counts, and available time. At each sample point, a 1/40th acre fixed-radius plot was established.

The fixed-radius plots (radius 18.6 feet) consisted of a tally of all the new (1992) egg masses observed on the overstory trees, understory vegetation, ground litter and duff. The total number of egg masses observed for each plot was then multipled by 40 to determine egg masses per acre using the following equation:

$$Y = 40X$$

where,

Y = egg masses per acre

X = number of egg masses observed in the plot

RESULTS

Patuxent River Naval Air Station

Table 1 presents the egg mass survey results at Patuxent River Naval Air Station. Figure 1 shows the location of the 13 plots. Only one egg mass was detected during the survey.

Indian Head Naval Ordnance Station

Table 2 presents the egg mass survey results at Indian Head Naval Ordnance Station. Figure 2 shows the location of each of the 29 plots. Egg masses were detected at 12 of the 29 survey plots.

The majority of the egg masses were found in the Stump Neck area of the facility which consists of approximately 175 acres (Figure 3). Gypsy moth egg mass densities in this area ranged from 0-3480 and averaged 940 egg masses per acre. The egg masses were large (quarter size and larger) and appeared healthy. Oaks, the preferred food of the gypsy moth, are abundant in this area and make up at least 50 percent of the overstory.

DISCUSSION

The basic guidelines used to predict the degree of defoliation include evaluation of the past defoliation history of the area in question, number of egg masses/acre, size and condition of the egg masses, available preferred

food, terrain and risk of larval blow-in following egg hatch. Potential defoliation is categorized as follows: light (1-30 percent); moderate (31-60 percent); and heavy/severe (61-100 percent).

No defoliation is expected to occur at Patuxent River Naval Air Station next year. Gypsy moth populations are sufficient to cause heavy defoliation (61-100 percent) in the 175 acre section of Stump Neck of Indian Head Naval Ordnance Station in 1993. Elsewhere at Indian Head Naval Ordnance Station, no significant defoliation is likely to occur.

The infected area at Indian Head Naval Ordnance Station meets the treatment threshold of 500 egg masses per acre used for timber management. The results of this survey should be used in conjunction with your resource management objectives to assess the potential impact that both heavy defoliation and possibly some tree mortality would have in meeting your management goals. Predicting the extent of tree mortality that would occur after one year's defoliation is difficult. Generally speaking however, a stand of trees that is not stressed by other agents during or immediately following a single heavy defoliation will likely pull through with only minor branch dieback and minimal mortality. Trees that have been subjected to two or more years' defoliation, or trees that are stressed by other agents, will have the greatest risk of mortality.

An example of the potential impact, in terms of dollar value, is provided by a damage appraisal conducted by the Pennsylvania Bureau of Forestry on 255,290 acres following a gypsy moth outbreak. The loss assessment showed that tree mortality that occurred between 1984-87 averaged $174.49 per acre (using 1987 stumpage values). On the Allegheny National Forest in untreated stands consisting of 40-80% oak, the average loss of basal area (mainly oaks) was about 16 percent (range 3-28 percent) following one year of defoliation and 26 percent (range 10-43 percent) after two consecutive years of defoliation. In both cases, droughty conditions likely contributed to the level of mortality.

Three management options have been evaluated for managing gypsy moth populations at Patuxent River Naval Air Station and Indian Head Naval Ordnance Station. The intervention options are offered based upon the following objectives: 1) protecting host tree foliage; 2) preventing tree mortality; and, 3) reducing gypsy moth populations. Each is discussed below.

No Action Option

It is possible that gypsy moth populations could collapse on their own due to the presence of NPV (nucleopolyhedrosis virus) or the more recently recognized fungal pathogen *Entomophaga maimaiga*. In areas with defoliating level gypsy moth populations (greater than 250 egg masses per acre) viral and fungal epizootics generally manifest themselves after significant tree defoliation has already occurred. Gypsy moth populations will usually peak in 2-3 years once they reach defoliating levels and then collapse as a result of NPV or fungal activity. Residual populations following such a collapse will likely remain at low densities for 3-6 years before rebuilding to defoliating levels. Although it is not possible to accurately assess such events with the information at hand, the large egg mass size and the recent population build-up at Indian Head Naval Ordnance Station suggest that this population as a whole is still building and a collapse is not likely to occur in 1993.

Trees that are defoliated in excess of 40 percent normally refoliate the same growing season. Such events cause the trees to expend valuable energy reserves to refoliate, and consequently cause the trees' health to deteriorate. Depending on the condition of the trees at the time of defoliation, reduced growth, branch dieback or in some cases tree mortality, are likely to occur following a single year of heavy defoliation. Should subsequent defoliation occur the following year, the impact is compounded. Trees that receive light-moderate defoliation (<50 percent) generaly will not refoliate and there is probably no significant impact other than some reduction in growth.

Trees at greater risk for branch dieback or mortality are those that are presently stressed from other factors, such as: 1) soil compaction from roads, sidewalks, parking lots, machinery and/or heavy foot travel; 2) over

maturity; 3) drought; 4) shock due to recent timber cutting activities; 5) previous year(s) defoliation; and 6) other insect or disease related problems.

Should no intervention action occur at Indian Head Naval Ordnance Station to reduce gypsy moth populations in 1993, it is likely that population densities will increase and possibly expand to currently uninfested areas at this facility.

Chemical Insecticide Option

The second option is to use a chemical insecticide to control gypsy moth populations. Dimilin® (diflubenzuron) is the most widely used chemical insecticide in gypsy moth suppression projects in the northeast. Diflubenzuron (DFB) is an insect growth regulator that disrupts the normal molting processes of the larvae. The mode of action is to inhibit the formation of chitin, a necessary component of the outer cuticle which causes the affected larvae to die during the molt following treatment. The method of uptake is primarily by ingestion, however, recent research has indicated the possibility of absorption through the cuticle as well.

Dimilin is registered by EPA for use in residential areas. It is, however, extremely toxic to some aquatic invertebrates, and the label prohibits the application over open water or wetlands. The Maryland Department of Agriculture's current policy on the use of DFB is to provide a minimum of a 100 foot no-spray buffer around open waterways and wetland areas. DFB is available as a 25 percent wettable powder (Dimilin 25W), and an oil based liquid formulation (Dimilin 4L). Both formulations are applied in a single application. With proper application, foliage protection and a significant population reduction can be expected with DFB. The need for treatment of residual populations the following year would be unlikely.

Microbial Insecticide Option

The third option is to use a microbial insecticide to manage gypsy moth populations. The only biological insecticide currently registered and commercially available for gypsy moth control is the microbial insecticide *Bacillus thuringiensis* variety kurstaki (*B.t.*). This insecticide is available through several manufacturers and has been used extensively in suppression projects throughout the U.S. in both forested and residential areas. *B.t.* is a bacterium that acts specifically against lepidopterous larvae as a stomach poison and therefore must be ingested. The major mode of action is by mid-gut paralysis which occurs soon after feeding. This results in a cessation of feeding, and death by starvation.

B.t. formulations are available as flowable concentrates, wettable powders, and emulsifiable suspensions. The normal application rates range from 16-30 billion international units (BIUs) per acre in a single application and 16-30 BIUs in double applications. *B.t.* can be applied either undiluted or mixed with water for a total volume of 1/2 - 1 gallon per acre. With proper application, foliage protection and some degree of population reduction can be expected with one application and with two applications both foliage protection and a significant population reduction is likely. The degree of population reduction varies and may depend on, at least in part, the selected application rate, populations densities and the weather (rain and temperature) and the feeding activity of the larvae following treatment.

Alternatives

With the previously described options in mind, the following four (4) alternatives are offered.

Alternative 1. – No action.

Alternative 2. – Single application of either DFB formulation.

Alternative 3. – A single aerial application of *B.t.* applied at the rate of 30 BIUs in a total mix of 1/2-1 gallon per acre.

Alternative 4. – Two aerial applications of *B.t.* at the rate of 24-30 BIUs in a total mix of 1/2-1 gallon per acre. The second application should be applied 5-7 days following the first.

RECOMMENDATIONS

Patuxent River Naval Air Station

Gypsy moth population levels are low at this Naval facility, averaging only 3 egg masses per acre. No noticeable defoliation is expected to occur in 1993. Therefore, our recommendation for this site is to take no action.

Indian Head Naval Ordnance Station

Gypsy moth populations are sufficient to cause heavy defoliation in the 175 acre block (see Figure 2) in 1993. As a result, some direct action should be taken to protect tree foliage, prevent tree mortality, and reduce gypsy moth populations.

Therefore our recommendation is to aerially treat the gypsy moth infested area consisting of approximately 175 acres in the Stump Neck area of Indian Head Naval Ordnance Station as described in Alternative 3. Treatment elsewhere at the Station will not be necessary.

Given the proximity of the infested area to the Potomac River and the sensitivity of some aquatic organisms to DFB, *B.t.* would be our insecticide of choice at Indian Head Naval Ordnance Station. Of the two *B.t.* treatment alternatives offered, Alternative 3 is our preferred alternative. This alternative was selected based on the following considerations:

1) population densities are not excessively high in that adequate population reduction to prevent the need for retreatment in 1994 is probable;

2) foliage protection and prevention of any subsequent tree mortality is achieveable;

3) a single application is more economical; and

4) *B.t.* formulations used for gypsy moth management have no known potential impact on aquatic ecosystems, particularly aquatic invertebrates.

Table 1.–Gypsy Moth Egg Mass Survey Results at Patuxent Naval Air Station, October 6, 1992.

Plot Number	Number EM/Acre
1	0
2	0
3	0
4	0
5	0
6	0
7	0
8	40
9	0
10	0
11	0
12	0
13	0

Range = 0-40 EM/Acre
Average = 3 EM/Acre

Table 2.–Gypsy Moth Egg Mass Survey Results at Indian Head Naval Ordnance Station, September 29, 1992.

Plot Number	# EM/Acre
1	80
2	80
3	40
4	80
5	0
6	0
7	0
8	0
9	0
10	0
11	0
12	0
13	0
14	0
15	0
16	0
17	0
18	280
19	3480
20	2360
21	1080
22	0
23	40
24	80
25	280
26	40
27	0
28	0
29	0

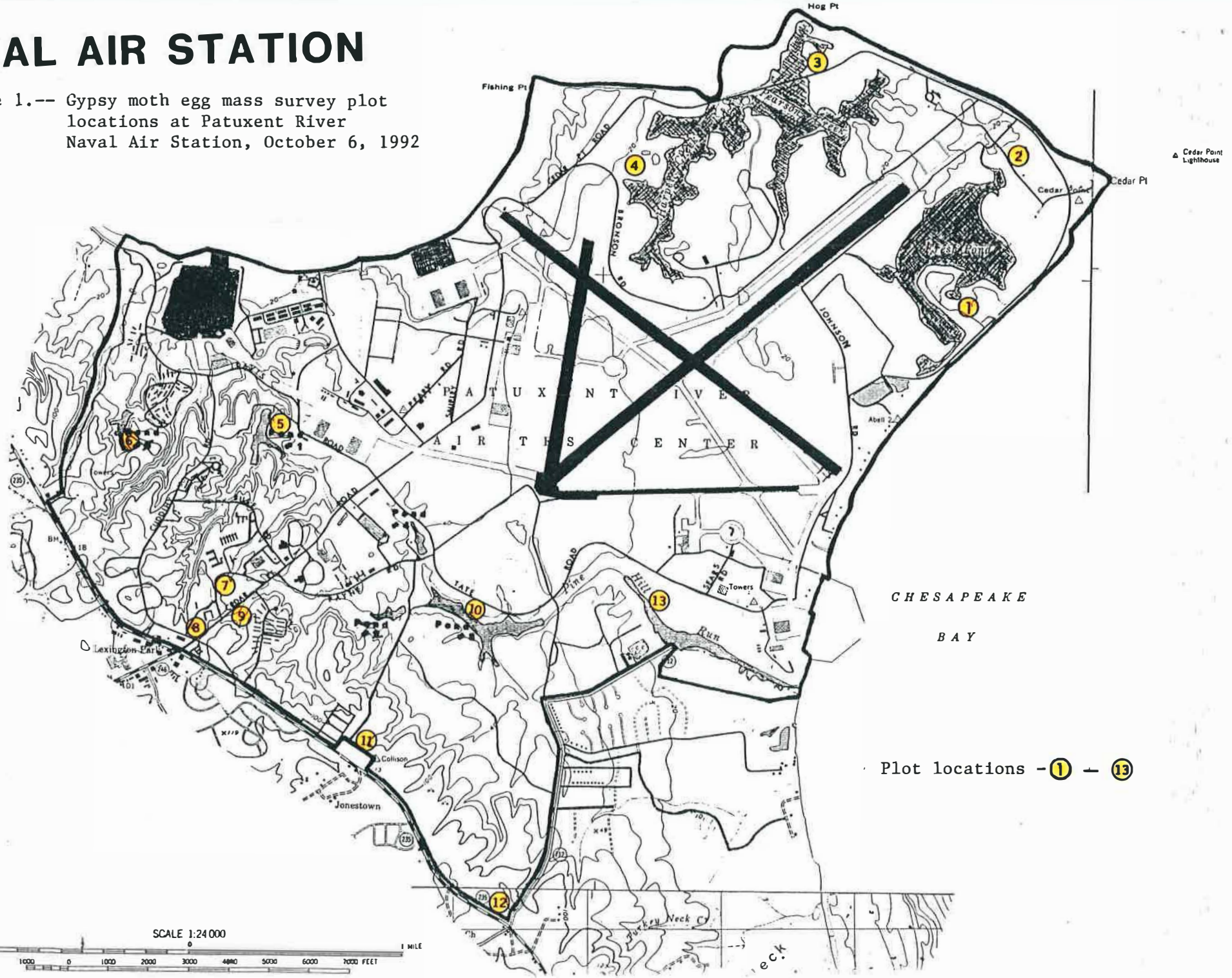
Station-Wide Range = 0-3480 EM/Acre
Average = 273 EM/Acre

Range in 175 acre infested area = 0-3480 EM/Acre
Average = 940 EM/Acre

PATUXENT RIVER

NAVAL AIR STATION

Figure 1.-- Gypsy moth egg mass survey plot locations at Patuxent River Naval Air Station, October 6, 1992



INDIAN HEAD NAVAL ORDNANCE STATION

Figure 2. -- Gypsy moth egg mass survey plot locations, Indian Head Naval Ordnance Station, September 29, 1992.

Plot Locations = ① - ㉙

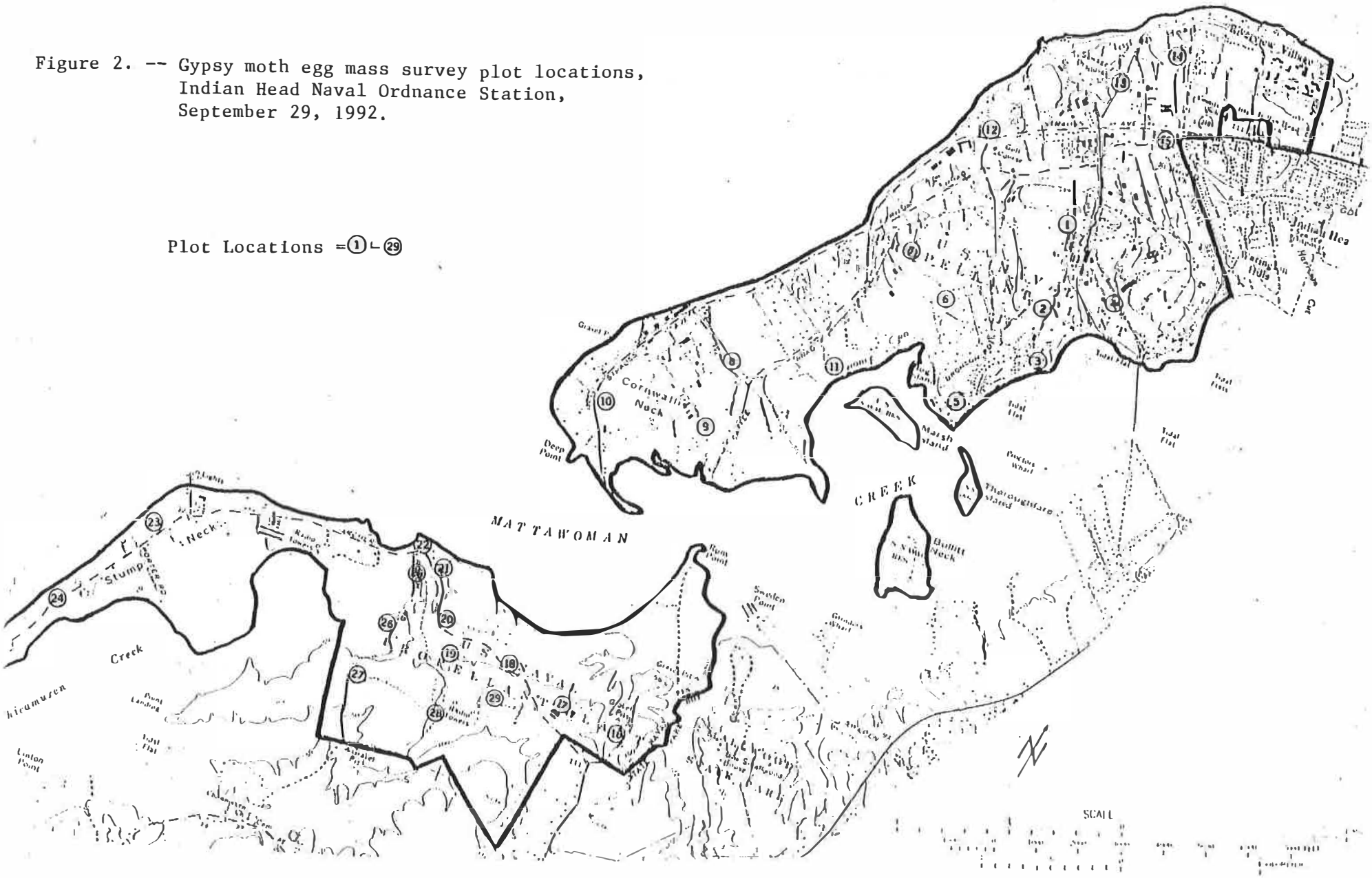
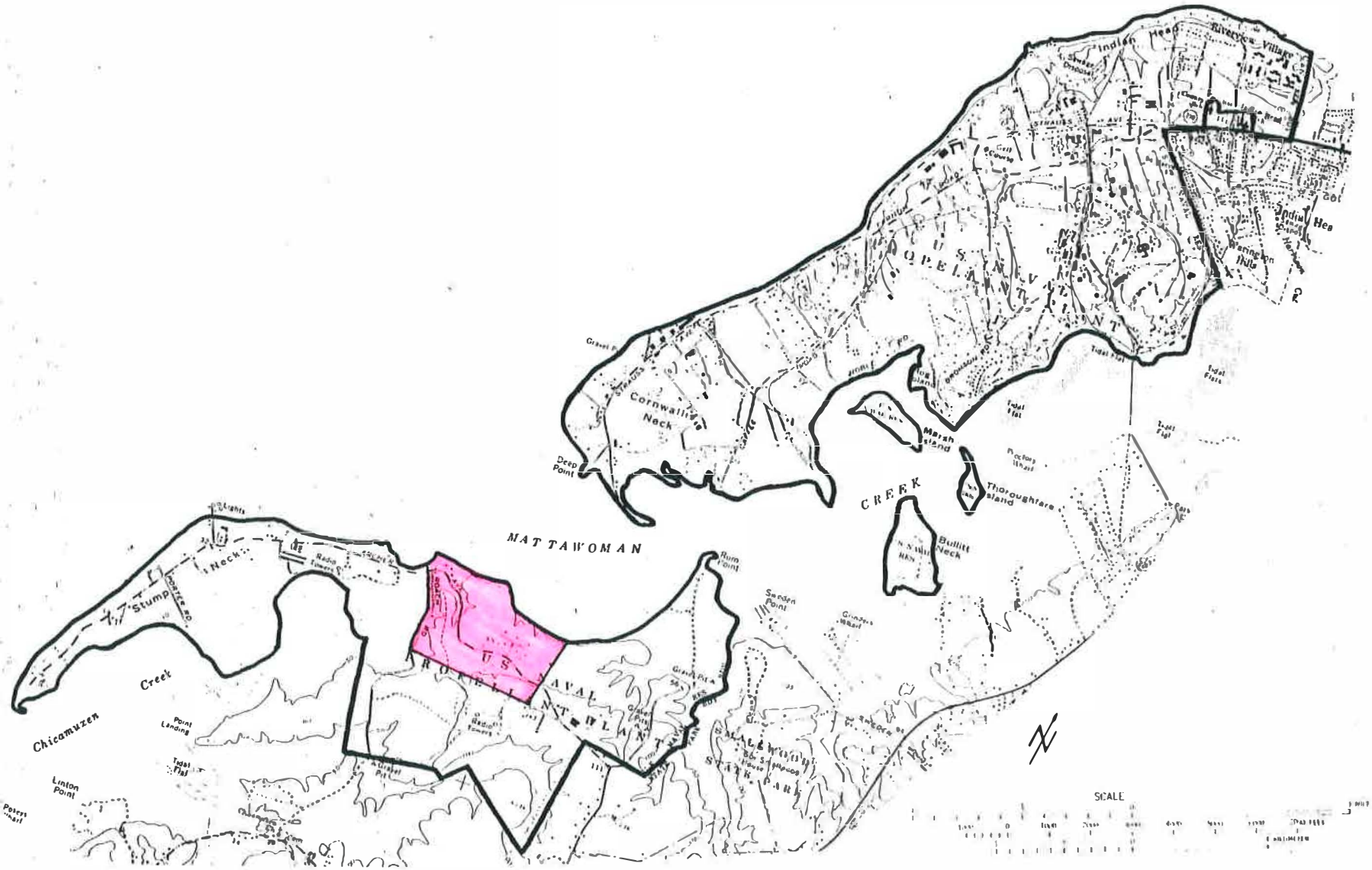


Figure 3. -- Indianhead Naval Ordnance Station

Areas where noticeable defoliation is likely to occur.



United States Department of Agriculture | Forest Service | Northeastern Area State & Private Forestry | 180 Canfield Street Morgantown, WV 26505

Reply To: 3460

Date: November 25, 1992

Mr. Joseph Hautzenroder
Resource Manager
U.S. Navy
Naval Facilities Engineering Command
Washington Navy Yard
Washington, DC 20007

Dear Joe:

Enclosed for your information is a report documenting the current status of gypsy moth populations and our recommendations for managing the gypsy moth at Patuxent River Naval Air Station and Indian Head Naval Ordnance Station.

As we discussed, gypsy moth populations are low at the Patuxent River facility. No defoliation is anticipated and no treatment will be necessary at this site next year. Gypsy moth populations at Indian Head Naval Ordnance Station in the area of Stump Neck are sufficient to cause heavy defoliation (61-100 percent) in 1993. To prevent the defoliation, treatment of the infested area will be necessary this spring.

The treatment alternatives offered are based on the primary treatment objectives of preventing tree mortality, protecting tree foliage and reducing gypsy moth populations. To meet these objectives, it is our recommendation that you aerially treat the infested area (175 acres) using a single application of Bacillus thuringiensis applied at the rate of 30 billion international units in a 0.5-1.0 gallon total mix per acre formulation.

Should you choose to follow through with our treatment recommendation, please contact me and we can discuss in detail other technical assistance and support that our office can provide. I can be reached at (304) 285-1546.

Good luck, and we look forward to working with you in the future.

Sincerely,

Melissa A. Emerson

for BRADLEY P. ONKEN
Forester
Forest Health Protection

Enclosure

cc: Jeff Bossart
R.Wolfe

BPO/mae